U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Chamaesyce deltoidea* (Engelm. ex Chapm.) Small ssp. *pinetorum* (Small) A. Herndon

COMMON NAME: Pineland sandmat

LEAD REGION: 4

INFORMATION CURRENT AS OF: August 2006

STATUS/ACTION:

___ Species assessment--determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

___ New candidate

_X_ Continuing candidate

___ Non-petitioned

_X_ Petitioned - Date petition received: May 11, 2004

__ 90-day positive - FR date:

__ 12-month warranted but precluded - FR date:

__ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? _yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? _yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations, and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov/).

__X_ Listing priority change

Former LP: _6_

New LP: _12_

Date when the species first became a Candidate (as currently defined): October 25, 1999

___ Candidate removal: Former LP: ___

___ A - Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F - Range is no longer a U.S. territory.

___ I - Insufficient information exists on biological vulnerability and threats to support listing.

___ M - Taxon mistakenly included in past notice of review.

___ N - Taxon may not meet the Act's definition of "species."

___ X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering Plants, Euphorbiaceae, Spurge Family

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Florida, U.S.A.

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Florida, Miami-Dade County, U.S.A.

LAND OWNERSHIP: There are 16 known occurrences, seven of which occur on public lands (The Institute for Regional Conservation [IRC] unpublished data 2005; Bradley and Gann 1999). By far the largest population is within Long Pine Key in Everglades National Park (ENP). Six sites are owned by Miami-Dade County: Florida City Pineland, Navy Wells Pineland (=Navy Wells Park), Palm Drive Pineland, Rock Pit #39, Seminole Wayside Park, and Fuchs Addition (IRC unpublished data 2005; Gann et al. 2002). The remaining nine sites occur on private land including the Pine Ridge Sanctuary, a small preserve managed by individual landowners.

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LEAD FIELD OFFICE CONTACT: South Florida Ecological Services Office, Paula Halupa, 772-562-3909 ext. 257, paula_halupa@fws.gov

BIOLOGICAL INFORMATION:

Species Description: *Chamaesyce deltoidea* ssp. *pinetorum* is a small erect or nearly-erect herbaceous perennial forming small tufts. The stems have rather long hairs, as do the leaves, whose blades range in shape from kidney-shaped to triangular to oval. The "flowers" are specialized structures called cyathia, characteristic of the genus Euphorbia and its closest relatives. The involucres are "1 mm long, pubescent; glands green; gland appendages very narrow, even-edged; capsules 2 mm broad, pubescent; seed 1 mm long, transversely wrinkled, yellowish." This information was adapted by Bradley and Gann (1999) from Small (1933).

Taxonomy: "*C. deltoidea* was first described by Small (1905) as *C. pinetorum* for plants collected by him in 'pinelands between Cutler and Camp Longview' in 1903. Small recognized that it was closely related to *Chamaesyce deltoidea*, which is now known from further north on

the Miami Rock Ridge. Burch (1966) in a study of Caribbean *Chamaesyce*, retained the use of *C. pinetorum*. Some workers do not consider *Chamaesyce* to be a distinct genus. . . . In 1989, Oudejans published this taxon under the genus *Euphorbia*. Unfortunately, the name *Euphorbia pinetorum* was already in use for another taxon, so he produced the new name *Euphorbia smallii*. Other authors (Herndon 1993, Wunderlin 1998) have retained the use of the genus *Chamaesyce*. In a 1993 study, Herndon included this taxon within the *C. deltoidea* complex composed of three other taxa, two occurring further north on the Miami Rock Ridge, and one occurring on Big Pine Key in the Florida Keys (Monroe County). The three taxa on the Miami Rock Ridge have distinct ranges which abut each other. Herndon placed all four taxa at the same taxonomic level, treating each as a distinct subspecies, treating [the pineland sandmat] as *C. deltoidea* ssp. *pinetorum*. *C. deltoidea* ssp. *adhaerens* occurs immediately to the north of it, and *C. deltoidea* ssp. *deltoidea* occurs to the north of [ssp.] *adhaerens*." (Bradley and Gann 1999, with minor editorial changes in brackets). Wunderlin and Hansen (2003) follow Herndon's treatment of this species. We have carefully reviewed the available taxonomic information to reach the conclusion that the species is a valid taxon.

Habitat: This species occurs in pine forests on limestone rock (pine rocklands). It is shade intolerant and requires periodic burning to reduce competition from woody vegetation. "This species occurs in pine rockland in pockets of clayey marl or on oolitic limestone. The soils on which it occurs outside of Everglades National Park are classified as Opalocka rock-outcrop soils (soils within the National Park have not been classified) (USDA 1996). The pine rocklands where this plant occurs are at the southern end of the Miami Rock Ridge and are at lower elevations than most pine rockland areas to the north. This is especially true for the pine rocklands on Long Pine Key [in ENP], which flood occasionally. Fire is an important element in maintaining the pine rockland habitat. Periodic fires eliminate the shrub subcanopy and remove litter from the ground." (Bradley and Gann 1999).

Historical Range/Distribution: "*C. deltoidea* ssp. *pinetorum* was historically known from only the southern portions of the Miami Rock Ridge in southern Miami-Dade County. The northernmost occurrences were found at S.W. 296 Street (latitude ca. 25° 29.52') and possibly as far north as S.W. 248 Street (latitude ca. 25° 32.14'). It extended south through Long Pine Key in Everglades National Park." One purported locality may have been reported inaccurately. "A specimen was collected by Burch (No. 232, NYBG) in 1963 at the intersection of S.W. 187 Avenue and 248 Street. The label describes the station as 'Princeton.' This intersection is over five miles west of the area known as Princeton, and three miles north of the northernmost confirmed station for this taxon." (Bradley and Gann 1999).

Current Range/Distribution: The pineland sandmat is known only from the southern portion of the Miami Rock Ridge in southern Miami-Dade County, Florida (Small 1933, Long and Lakela 1971, Wunderlin 1998) and extends south through Long Pine Key in ENP (Bradley and Gann 1999). The current range is similar to the historic range, although most of the former habitat outside of ENP has been lost; only small remnants remain. Plants occur within ENP, on lands managed by Miami-Dade County (i.e., Florida City Pineland, Navy Wells Pineland [= Navy Wells Park], Palm Drive Pineland, Rock Pit #39, and Seminole Wayside Park) (Bradley and Gann 1999; Gann et al. 2002). This plant is also known from the small, private Pine Ridge Sanctuary and the Navy Wells #2 site, owned by the Miami-Dade County School Board, but not

considered a conservation site (Bradley and Gann 1999; Gann et al. 2002). The status of the plant in other locations on private land was considered undetermined by Bradley and Gann (1999) because the plant was not seen in these locations.

Population Estimates/Status: Bradley and Gann (1999) estimated the population size at ENP to be 10,000 – 100,000 plants. Botanists at IRC now estimate the population is roughly 10,000 (K. Bradley, IRC, pers. comm. 2006). Populations on other public and private lands are smaller. According to the most recent data from IRC (unpublished data 2005), three sites each have a broad estimated population of 1,000 – 10,000 (two private), four sites each have an estimated population of 100 -1,000 (one private), and eight sites each have an estimated 10 -100 individuals (five private). A more detailed survey is needed to determine more precise population estimates at each site (K. Bradley, pers. comm. 2006). In assessing the overall status and trend, Bradley and Gann (1999) indicated that the population of the pineland sandmat is probably declining due to the threats to this species.

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range. Much of the habitat of the pineland sandmat has been negatively altered by human development. Kernan and Bradley (1996) reported that pine rocklands in Miami-Dade County had been reduced to about 11 percent of their former extent. Of the estimated historical extent of 74,000 hectares (ha) (182,800 acres), only 8,140 ha (20,110 acres) of pine rocklands remained in 1996. Outside the ENP, only about 1 percent of the Miami Rock Ridge pinelands have escaped clearing, and much of the remaining pinelands are in small remnant blocks isolated from other natural areas (Herndon 1998). In short, most of the pine rockland from the plant's northernmost occurrence south to ENP has been developed, and few occurrences of this species remain (Bradley and Gann 1999). The area outside of ENP represents nearly half of the range of this taxon (Bradley and Gann 1999).

Pinelands were mapped for Miami-Dade County's geographic information system in 2004. The data confirm the limited extent of remaining pine rocklands outside of ENP and document severe losses of privately-owned pinelands over the past decade. Even some publicly owned pinelands where this species occurs are vulnerable to development. The largest site outside of ENP is 140 hectares (346 acres) in size, and all other sites are less than 8 hectares (20 acres) (Bradley and Gann 1999). Private sites where this species occurs are either not being managed or are being developed (Bradley and Gann 1999). Eight of the 16 sites where this plant is known to occur are on private land at-risk of development (IRC unpublished data 2005).

Management of pine rocklands outside of ENP in Miami-Dade County is complicated because most of the remaining habitat occurs in small fragmented areas that are bordered by urban development and invasive exotic plants (Bradley and Gann 1999). Areas surrounding managed lands that contain exotics can act as seed sources allowing exotics to continue to invade the pine rockland. The mapping project, conducted by IRC, to inventory natural forest communities confirms problems of habitat encroachment and degradation by native tropical hardwoods and invasive exotic species on sites that are not carefully maintained (see

factor E). Even a small preserve with this species, owned by a nonprofit conservation organization, is overgrown for lack of management funds. As part of a Private Stewardship grant awarded to IRC, landowners within the range of the species are being trained and assisted in pineland management methods that will benefit the species.

Everglades restoration is being planned and one objective is to provide more water to the Taylor Slough area and rehydrate the area around Long Pine Key. Although Bradley and Gann (1999) and Herndon (1998) expressed concern that hydrologic manipulations to Taylor Slough and Shark River Slough could affect the occurrence of this taxon in ENP, Bradley (pers. comm. 2006) now believes that threats due to hydrologic changes associated with Everglades restoration may not impact this species because ENP may not receive additional water. At this time, it is difficult to predict the potential effects of hydrologic changes associated with Everglades restoration on the pineland sandmat. However, if restoration causes excessive flooding within Long Pine Key, the largest and most protected population of the pineland sandmat would likely be damaged. At this time we view hydrologic changes as a potential threat that could occur in the future.

B. Overutilization for commercial, recreational, scientific, or educational purposes. Not known.

C. Disease or predation. Not known.

D. The inadequacy of existing regulatory mechanisms.
The Florida Department of Agriculture and Consumer Services designated *Chamaesyce deltoidea*, consisting of three subspecies, including ssp. *pinetorum*, as endangered under Chapter 5B-40, Florida Administrative Code. This listing provides little or no habitat protection beyond the State's Development of Regional Impact process, which discloses project impacts, but provides no regulatory protection for State-listed plants on private lands. Without local or county ordinances preventing the destruction of the plant, conservation does not occur.

E. Other natural or manmade factors affecting its continued existence.
Fire suppression and invasive exotic species are major threats to this species on both public and private lands.

Fire is a critical element in maintaining pine rockland habitat. The pine rocklands of Miami-Dade County have evolved and adapted to frequent fires (Snyder et al. 1990). Under natural conditions, lightning fires typically occurred at 3 to 7-year intervals. With fire suppression, hardwoods invade pine rocklands and shade understory species, such as the pineland sandmat. Pine trees, understory shrubs, grasses, and herbs all contribute to an ever-increasing duff layer in the absence of fire. When the duff becomes thick, it covers herbs and prevents most seeds from germinating. In addition to removing duff, fires leave ashes that provide important nutrient cycling. Fire suppression has reduced the areas that do burn, and habitat fragmentation has prevented fire from crossing the landscape in a natural way. Without regular prescribed fire, pine rockland vegetation gradually transforms into tropical hardwood hammock.

Invasive exotic plant species alter the type of fire that occurs in pine rocklands. Historically, pine rocklands had an open low understory where natural fires remained patchy with low temperature intensity, thus sparing many native plants such as the pineland sandmat. Dense exotic plant overgrowth may no longer allow the species to be conserved through prescribed burning. Dense growth can create high fire temperatures and longer burning periods that pine rockland plants cannot tolerate. With too much growth of exotic species, such as Burmareed (*Neyraudia reynaudiana*) and Brazilian pepper (*Schinus terebinthifolius*), it is impossible to conduct a safe burn because it will be too hot. Native hardwoods also encroach on pinelands, and if burned can cause a hot, destructive fire.

At least 277 taxa of exotic plants have invaded pine rocklands throughout south Florida (U.S. Fish and Wildlife Service 1999). In general, the control of invasive exotic species in pine rocklands is a very important component of habitat management (Bradley and Gann 1999). Under current conditions, exotic plant control may require alternate, more labor intensive methods such as hand chopping followed by spot herbicide treatment, which is costly. Removal within heavily infested areas is labor intensive and often requires field crews pulling the plants by hand or cutting. Prescribed fire and herbicide treatments are then used to control the exotics. Once cleared, proper management can reduce the costs of control and maintenance (Bradley and Gann 1999).

Invasive exotic species, especially Burmareed and Brazilian pepper, threaten the pineland sandmat and other rare pine rockland plants on public and private lands (Bradley and Gann 1999). These two exotic species are of most serious concern to pineland sandmat (K. Bradley, pers. comm. 2006). Other invasive exotics such as Old World climbing fern (*Lygodium microphyllum*), which is spreading toward Long Pine Key in ENP, and melaleuca (*Melaleuca quinquenervia*) are also a concern. Cogon Grass (*Imperata cylindrica*) and Burmareed have also been observed and treated in the Boy Scout Camp and along the eastern boundary at ENP (NPS 2005). The NPS believes that both could expand into the pinelands and may become problematic because of their fire adaptations (NPS 2005).

Bradley and Gann (1999) state that invasive exotic species are expected to continue to decrease the quality of the pine rocklands where this taxon occurs. However, the National Park Service (NPS) has implemented prescribed fire to control the spread of invasive exotic plant species within ENP and Bradley (pers. comm. 2006) believes fire management by the National Park Service (NPS) is being conducted effectively for this species in ENP and is not a threat at this time. The NPS acknowledges Brazilian pepper as an aggressive invader that is widespread throughout its pinelands fire management unit (FMU 3) in ENP and has generally kept this species in-check in undisturbed sites by prescribed fire (NPS 2005). It is not known if the NPS will have the resources to continue this in the future or be able to monitor the population, but at this time, the overall threat of exotics to pineland sandmat at ENP appears to be under control due to prescribed fire at ENP (K. Bradley, pers. comm. 2006).

Bradley and Gann (1999) indicate that the management of pine rocklands outside of ENP in Miami-Dade County is complicated because remaining habitat occurs in small fragments bordered by urban development. For the 15 populations outside of ENP, it is difficult or

impossible to conduct effective prescribed fires in small pine rockland fragments elsewhere in Miami-Dade County due to the size of the properties and proximity to the urban environment. Given the acreage of land, staffing, and budget constraints, this method may not be feasible in all sites, especially small sites owned by Miami-Dade County or on private lands.

Miami-Dade County has purchased and restored some pine rocklands fragments. Overall, the available information indicates that over the last decade, this species has benefited from the County's land acquisition program and management activities, including exotic plant control and prescribed fire. The one privately-owned conservation site with this plant appears in good condition. However, pineland sandmat located on unprotected sites on private land remain at risk to invasive exotic species, lack of fire management, and fragmentation from development.

Based on the relatively low number of occurrences within a narrow and restricted range, catastrophic disturbance from hurricanes or their aftermath (including trash dumping on conservation lands, a problem after Hurricane Andrew in 1992) may also negatively affect the pineland sandmat.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

The Service participated in a project to map the Natural Forest Communities of Miami-Dade County outside of ENP. This project covered all public sites and those private ones for which the landowners granted written permission. The Service has, over the past decade, supported exotic pest plant control and other conservation measures for pine rocklands. The principal conservation agency for pine rocklands is Miami-Dade County, through its Parks department and Department of Environmental Resources Management. The County has purchased and restored some pine rockland fragments. The NPS has implemented prescribed fire to control the spread of invasive exotic plant species within ENP.

SUMMARY OF THREATS (including reasons for addition or removal from candidacy, if appropriate)

The pineland sandmat's habitat is globally imperiled and has been reduced to 11 percent of its former extent (Kernan and Bradley 1996). At its remaining locations, the pineland sandmat and its habitat are vulnerable to a variety of natural and human factors. Fire suppression, inappropriate fire management, and wildfire may destroy this plant or its habitat. Invasive exotic species are a serious threat to populations of the plant on public and private lands. The threat of exotics to the pineland sandmat is especially severe when it occurs within small and unmanaged fragments in urban areas. However, management activities by Miami-Dade County, including exotic plant control and prescribed fires, have benefited the pineland sandmat. Exotic species within ENP are also a threat to the pineland sandmat; but this threat appears to be abated due to efforts by NPS. Hydrologic changes associated with Everglades restoration were identified as a threat that may affect the occurrence of this taxon in ENP; however, at this time we view hydrologic changes as a potential threat that could occur in the future. If restoration causes excessive flooding in the pine rocklands of Long Pine Key, this would damage the largest and

most protected population of pineland sandmat. Although pineland sandmat located within the ENP and sites owned by Miami-Dade County are being managed, plants on unprotected sites on private land remain at risk to habitat loss, degradation, and fragmentation from development.

For species that are being removed from candidate status:

___Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES

Remaining unprotected pine rockland fragments need to be conserved. Invasive exotic plants and native hardwoods need to be controlled on public and private lands. Prescribed fires need to be conducted at appropriate fire intervals and temperatures. Bradley and Gann (1999) suggest that a mosaic of burns be used in the management of pine rocklands. Recommended burn regimes are considered to be three to seven years with summer fires generally preferred to winter (Bradley and Gann 1999). For areas where fires have been suppressed for many years, they suggest the reintroduction of fire be done in a step-wise fashion. According to Bradley and Gann (1999), winter burns may be needed in some areas or removal of fuel may be needed to prevent a hot fire. Bradley and Gann (1999) also recommend that any prescribed fire management include a monitoring program to determine the effectiveness of the prescription. Private landowners interested in conserving their pinelands need training and assistance. To protect natural vegetation throughout this plant's range, it is an urgent priority to develop effective biological control agents and other control methods for Old World climbing fern. In addition, since the effects of future hydrologic changes as a result of Everglades restoration on pineland sandmat are unknown and difficult to predict, the effects of any proposed hydrological manipulations should be monitored (Bradley and Gann 1999)

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11

		Subspecies/population	**12***

Rationale for listing priority number:

Magnitude: The largest population of the pineland sandmat, estimated at approximately 10,000 plants, is protected within ENP. The largest threat to this population is from invasive exotic species, but the NPS has effectively used prescribed fire to control the exotics within Long Pine Key at the present time. All other populations of the pineland sandmat are smaller and occur on isolated pine rockland fragments in heavily urbanized Miami-Dade County. Populations on both public and private lands in urban Miami-Dade County are inherently vulnerable to invasion by exotic plants, fire suppression or inadequate prescribed fire, and lapses in management or constrained management. However, at this time, populations on lands managed by Miami-Dade County are benefiting. Those populations on private lands are at risk to development and habitat degradation. Overall, the magnitude of threats to this species is moderate.

Imminence: Invasive exotic species currently threaten the pineland sandmat on most public and private lands. Threats from exotic species on small parcels are exacerbated due to continual influx of seed sources from adjacent sites. Fire suppression and lack of fire management are also currently occurring to the small, isolated populations of pineland sandmat in urbanized areas. Natural fire or prescribed fire is necessary to maintain pine rocklands and prevent the transition to hardwoods. Small, remaining populations on private, unprotected lands are at risk to development and habitat degradation. At this time, however, threats to the largest population of the pineland sandmat at ENP are being controlled through management actions by NPS. Hydrologic changes at ENP are not a threat to this population at the present time, but may become of greater concern in the future. Since the largest population is being effectively managed and efforts are being made to address threats at some smaller populations, the overall immediacy of the threat to the pineland sandmat is considered non-imminent.

Rationale for Change in Listing Priority Number (insert if appropriate): After thorough review of the species' status we have determined that the threats are non-imminent.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No. There is time for issuing a proposal and final rule and no issues, such as illegal collecting, require immediate protection**.**

DESCRIPTION OF MONITORING: The largest population of the pineland sandmat is on Long Pine Key, a pineland area within ENP. Although ENP is not formally monitoring this species, it is sponsoring a project to assemble historic data on species' occurrences and to conduct field work on a broad array of imperiled plant species. ENP has effectively controlled exotic plants at Long Pine Key with prescribed fire; however, it is not known if resources will be available in the future to continue this effort.

Outside of ENP, the Service participated in a project to map public and many private Miami-

Dade County natural forest communities for the County's geographic information system, which provided a list of plant species for each site. The project allows the County to manage information on pinelands, making it possible to detect changes in the extent of natural forest communities. Some sites appear too overgrown to support fire in their current conditions. The one privately-owned conservation site with this plant appears to be in good condition.

Overall, the available information indicates that over the last decade, this species has benefited from Miami-Dade County's land acquisition program and management activities, including exotic plant control and prescribed fire.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: None

Indicate which State(s) did not provide any information or comments: Florida Department of Agriculture and Consumer Services

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: /s/ Ed Buskirk 8/14/2006
Acting Regional Director, Fish and Wildlife Service Date

Concur: _____ August 23, 2006
Acting Director, Fish and Wildlife Service Date

Do Not Concur: _____ _____
Director, Fish and Wildlife Service Date

Date of annual review: October 6, 2005; updated August 10, 2006
Conducted by: Paula Halupa, South Florida Ecological Services Office